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JUDGMENTS ON HANDWRITING SIMILARITY AND DIFFERENCE

HOLLINGWORTH in a recent article[1] on "Judgments of Similarity and Difference" has reviewed certain references to the general topic, and has, in particular, emphasized two points of criticism: (1) the assumption that categories logically opposite are necessarily psychological opposites; and (2) the statement that in certain instances a judgment of unlikeness is more easily passed than a judgment of likeness. Hollingworth would prove that "a judgment of unlikeness is not merely the reverse of a judgment of likeness, but a new kind of judgment," by exhibiting for a given group of reagents a higher coefficient of correlation for two arrangements of handwriting specimens on the basis of their resemblance to a given model than is found when a resemblance arrangement is correlated with an inverted order for difference. He would prove his second point, the greater ease of the likeness judgment, by showing an average higher correlation between two such arrangements for a number of reagents than that found for two difference arrangements.

First, a few words relative to the general merits of the question. Hollingworth is, of course, right in challenging the uncritical assumption of Downey[2] that when handwriting samples are arranged in the order of similarity to a standard the judgments become toward the close of the series judgments of dissimilarity. He asserts, "The 'least similar' is not therefore the 'most unlike,' " a statement which his experiments are thought to prove. The evidence[3] upon which the statement under criticism was based was (1) the much greater constancy of certain reagents toward the end of the scale than at the beginning, and (2) the procedure of certain reagents in utilizing as they arranged their samples a method of elimination of—which? The "most unlike" or the "least similar"? The instructions were definitely given to arrange the specimens in the order of their likeness to a given standard. The inverse method of procedure points to an interesting problem, some quality—"least likeness"?—seems to have been more insistent than "most likeness." If there is evidence for Hollingworth's assertion that a positive category is more easily utilized than a negative one, there may be justification for assuming that towards the close of an arrangement the criterion "least like" would be converted into the "most unlike," for surely the latter terms represent the more positive category of the two. In the absence of facts a quibble over words is, however, of little value. Hollingworth's resort to experiment is the proper thing. Apart from experiment one would have no justification in asserting the psychological identity of any two categories. Furthermore, we have ample evidence that any difference in instruction operates to induce some difference in the mental set of reagents.

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[1] *Psychological Review,* Vol. XX., pages 271–289.

[2] *Loc. cit.,* page 273.

[3] Downey, J. E., "Preliminary Study of Family Resemblance in Handwriting," *Bull. No. 1, Dept. of Psychol., Univ. of Wyoming.*

Again, Hollingworth questions the inference that difference is more easily seen than likeness. Here also he criticizes Downey, who, on account of the lower average variability toward the close of the scale in the placing of handwriting specimens in the order of their resemblance to a certain standard, had concluded that for the *material utilized in the test* difference was *on the average* more easily seen than likeness. A more accurate statement would have been that a group of given reagents agreed more closely upon the specimens least like than upon the specimens most like a given sample, and that many individual reagents were more constant toward the close of the scale than at the beginning. The interpretation of such difference in variability at different points in the scale is at yet unsettled.[4]

Because of the individual differences in the method of procedure, as well as individual differences in the positions where repeated arrangements showed least variability, it seemed to the writer of the report under criticism that, possibly, the results pointed to an individual variation of some significance; that, possibly, some reagents concentrated spontaneously on difference, others on likeness.

Hollingworth in reviewing several opinions as to the relative ease with which likeness or difference is perceived seems to assume that either the one or the other category must be that which, apart from specific training, is the more easily applied. A third point of view is possible; ease with which difference or likeness is perceived may be a matter of individual organization.

It would not be difficult to find in literature statements of such a belief. To quote one only. Bacon writes, "There is one principal and as it were radical distinction between different minds, in respect of philosophy and the sciences; which is this: that some minds are stronger and apter to mark the differences of things, others to mark their resemblances. The steady and acute mind can fix its contemplations and dwell and fasten on the subtlest distinctions: the lofty and discursive mind recognizes and puts together the finest and most general resemblances. Both kinds, however, easily err in excess, by catching the one at gradations, the other at shadows.''[5] It is this aphorism closely following the one cited by Hollingworth which leads me to conclude that Bacon would not have sanctioned the substitution in it of ''similarities'' for ''affirmatives'' nor of ''differences'' for ''negatives.''

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[4] Hollingworth in discussing this point ("Experimental Studies in Judgment," Archives of Psychology, No. 29, page 102) writes: "In fact one might expect the difficulty to increase regularly toward one end of the series, unless the material were deliberately chosen so as to afford items on both sides of the zero-point of the quality being judged." I am inclined to think that in such arrangements as those based on resemblance in handwriting, just the thing suggested occurs, that is, certain reagents in order to diminish the strain on attention shift after some neutral point to the antithetic category. They have difficulty in understanding their error in technique even when it is explained to them. In my series of judgments on poetry where the arrangement passed, by instructions, from pleasantness to unpleasantness through a neutral point, a lower variability at the lower end of the scale than in the middle occurred. ("The Imaginal Reaction to Poetry," *Bull. No. 2, Dept. of Psychol., Univ. of Wyoming.*)

Can one doubt that difference may be as positive a quality as likeness? In any case the material upon which judgment is passed must be very influential in determining the relative facility with which the categories are applied, as Hollingworth recognizes in his explanation of Dearborn's report of greater ease in dissimilarity choices. In order to put the question to a test, judgments of similarity and dissimilarity must, of course, be passed on the same material, but if slight variation in the material introduces a shift in the relative ease of the two forms of judgment, there is little evidence of any practical distinction as to the facility with which they are applied.

In order to test the matter further I adopted provisionally the conclusion that relative ease in the perception of handwriting similarity or difference is a matter of individual organization, and that a repetition of Hollingworth's experiment might *with selected subjects* bring somewhat different results. Accordingly, reagents to be utilized in such an experiment were chosen on the basis of the experimenter's observation of their mode of reaction and their accuracy in a test on matching pairs of handwriting.[6]

Twelve reagents were selected. For perception of similarity there were chosen, first, three very rapid and accurate reagents in the pairing of hands, namely, Mfr., Eda., and Jan.; and, secondly, three subjects who reacted very quickly and, apparently, in impressionistic manner, namely, Ado., Awi., and Msm. Ado. and Msm., less accurate in their pairings than the first three reagents, made, however, only errors of exchange, a kind of error that appears to indicate a very general perception of similarity. Msm. and Awi. found it very much easier to pair addresses than to pair single words, a result that seemed also to point to an impressionistic reaction. For perception of difference six reagents were chosen as follows: Fmc. and Ssh., who showed extraordinary preoccupation with details; Tfo., who was accurate in her pairings, but reacted with excessive slowness and caution; Gab., who, very unsuccessful in finding matches, proceeded very definitely by a process of elimination of the specimens that *did not match;* Lth. and Meb., who were both slow and inaccurate. Of these twelve reagents, six were men, six women; all were seniors or juniors in college. Only one, Jan., was aware of the purpose of the experiment.

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[5] Nov. Org., Bk. I., LV.

[6] A report on this experiment will appear elsewhere.

It was, of course, recognized that selection of reagents on such slight observation was precarious, even granting the truth of the assumption that the tendency to maintain a likeness or difference set is an individual variant of some significance. The interpretation of the varying reactions is open to question. Logically, it would seem that success in pairing hands might result from ease in the perception of difference as readily as from perception of likeness, so that the choice of rapid and accurate reagents as those concentrating on likeness might well be subject to error. Furthermore, while an impressionistic method of reaction might possibly stand in opposition to a preoccupation with details, both might be open to an interpretation as a perception of either likeness or difference. The choice of slow and inaccurate subjects as those relying upon perception of difference also seemed questionable. The experimenter felt most confidence in the selection of Msm., Awi., and Ado. for perception of likeness; and of Gab., Ssh., and Fmc. for perception of difference.

The experiment was carried out according to Hollingworth's instructions except that no reagents were tested in the mixed order, an order which, according to Hollingworth's interpretation of his records, gives less clear-cut results than when the similarity and difference judgments are kept separate.

Two series of tests were tried. In the first series the material consisted of thirty-six specimens of handwriting, the address of the experimenter, five words cut out and pasted upon uniform cards. More than half of these samples were written by persons of various degrees of kinship. A duplicate of one of the hands was used as standard. There were two groups of six reagents each. In each group were placed three of the reagents chosen for perception of likeness and three of those chosen for perception of difference. The first group (similarity first) arranged the cards twice in the order of resemblance to the standard at week-intervals, and after that, also at week-intervals, arranged the cards twice in the order of difference from the standard. The second group (difference first) made the first two arrangements on the basis of difference from the standard and the last two on the basis of resemblance. The instructions (quoted from Hollingworth)[7] were typed and placed before each reagent during the test. For resemblance they read as follows:

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[7] *Loc. cit.*, page 277.

"Arrange the specimens of handwriting in an order of *resemblance to the standard.* Place the most similar specimens at the top, the *next most similar* in the second place, and the *least similar* at the bottom, with the remaining cards in their appropriate intermediate positions." For the difference arrangements the instructions read: "Arrange the specimens of handwriting in an order of *difference from* or *unlikeness* to the standard. Place at the top the card most different, the *next most different* in the second place, and the *least different* at the bottom, with the remaining cards in their appropriate intermediate positions."

In the second series, sixteen specimens of writing, the address of the experimenter, the same instructions were used. An attempt was made in this case to test the effect of material on the judgment. The test on the pairing of hands had shown that sample 15 of the duplicate series resembled a number of other hands in the first series, but that sample 6 was highly individualistic. Accordingly, six of the chosen reagents made four arrangements each of the sixteen samples as described above, three similarity first, three difference first with duplicate 15 as standard; and the six other reagents did the same with duplicate 6 as a standard. In each group were three reagents chosen for perception of likeness; three chosen for perception of difference.

It has been said that, in general, week-intervals separated each two groupings. The following irregularities occurred. For Ado. two weeks intervened between the first and second and between the third and fourth arrangements; for Eda. two weeks intervened between the first and second arrangements; for Lth. two weeks intervened between the first and second arrangement and ten days between the third and fourth. Two weeks intervened between Awi.'s second and third arrangement.

The coefficients of correlation were calculated by the formula

$$r = 1 - \frac{6\Sigma d^2}{n(n^2 - 1)}.$$

Table I. gives the positive coefficients of correlation for each two arrangements of the thirty-six cards by each of the twelve reagents. The results are presented in two groups in accordance with the experimenter's anticipations. Hollingworth's abbreviations are adopted in order to make comparison of our results with his an easy matter. S1 and D1 refer to the first trial for similarity and difference respectively; S2 and D2 to the second trials. The inverted order of difference was used for the correlation between the similarity and difference arrangement. In Table II. the results from the shorter series are tabulated.

We may survey the tables with the following questions in mind: (1) To what extent were the anticipations of the experimenter confirmed and the relative ease of perception of likeness and difference shown to be a matter of individual variation? (2) What evidence is there that the similarity judgment is more easily given than the difference judgment? Do more reagents give a higher correlation for the similarity arrangements? Or is the average correlation of the similarity arrangements higher than the average for the difference arrangements?

First, an attempt to answer these questions on the face of the returns, although, as will appear later, my own interpretation of the results gives such weight to practise effects as to make any answer to these questions on the basis of the present data very uncertain.

With reference to the first question it is evident that in the longer series the experimenter's anticipations were confirmed only five out of twelve times; in the shorter series eight out of twelve times. Selection might, then, have been made nearly as well at random, assuming that in a random selection we are as apt to strike a preoccupation with difference as one with likeness. Of the present reagents, Msm. and Jan. were well selected for perception of likeness; Meb., Gab., and Fmc. for perception of difference. The experimenter's confident selections were confirmed only in the case of Msm., Gab., and Fmc.

TABLE I

36 CARDS

Correlations between the Various Arrangements by the same Reagent

Chosen for Similarity Judgment						Chosen for Difference Judgment					
Reagent	*S*1 with *S*2	*D*1 with *D*2	*S*1 with *D*1	*S*2 with *D*2	*S*2 with *D*1	**Reagent**	*S*1 with *S*2	*D*1 with *D*2	*S*1 with *D*1	*S*2 with *D*2	*S*2 with *D*1
Msm., *S* 1st...	.818	.460	.484	.675	.455	Gab., *S* 1st....	.634	.773	.690	.708	.828
Eda., *S* 1st....	.740	.884	.645	.747	.764	Meb., *S* 1st ...	.582	.848	.606	.806	.743
Ado., *S* 1st....	.665	.716	.608	.661	.630	Lth., *S* 1st....	.701	.689	.656	.706	.779
Jan., *D* 1st....	.881	.842	.777	.838	.785	Fmc., *D* 1st...	.687	.702	.653	.514	.511
Mfr., *D* 1st....	.657	.731	.615	.806	.706	Tfo., *D* 1st....	.790	.692	.586	.626	.541
Awi., *D* 1st...	.666	.677	.687	.772	.790	Ssh., *D* 1st....	.877	.629	.718	.780	.647
Average........	.737	.718	.636	.749	.688	Average........	.711	.722	.653	.690	.674
Mean variation..........	.075	.10	.067	.055	.097	Mean variation..........	.081	.056	.038	.080	.108

It is true that if we consider the average coefficients for the two groups of reagents (longer series) we find that the group chosen for judgment of similarity gave a higher correlation for similarity than for difference, and the group chosen for difference gave a higher correlation for difference than for likeness. The difference between the averages is, however, so very slight and so obviously determined

TABLE II

16 CARDS

Correlations between the Various Arrangements by the same Reagent

Standard 15					Standard 6				
Reagents	*S*1 with *S*2	*D*1 with *D*2	*S*1 with *D*1	*S*2 with *D*2	Reagents	*S*1 with *S*2	*D*1 with *D*2	*S*1 with *D*1	*S*2 with *D*2
Msm., *S* 1st	.858	.847	.767	.860	Ado., *S* 1st	.788	.900	.782	.761
Eda., *S* 1st	.805	.950	.770	.868	Lth., *S* 1st	.514	.735	.773	.720
Gab., *S* 1st	.591	.805	.758	.688	Meb., *S* 1st	.535	.667	.658	.658
Jan., *D* 1st	.935	.702	.782	.732	Awi., *D* 1st	.685	.947	.914	.879
Fmc., *D* 1st	.929	.941	.929	.814	Tfo., *D* 1st	.937	.791	.902	.914
Ssh., *D* 1st	.847	.921	.802	.884	Mfr., *D* 1st	.905	.658	.544	.914
Average	.827	.861	.801	.807	Average	.727	.783	.762	.807
Mean variation	.086	.076	.042	.065	Mean variation	.149	.096	.107	.094

by the reactions of one or two reagents that these averages have little significance.

With reference to the second question, we find that seven out of the twelve reagents, longer series (eight in the shorter series), gave a higher correlation between the two difference arrangements than between the two arrangements for similarity, a preponderance in the direction opposite to that found by Hollingworth. The difference is pronounced in only five cases, and of these, three are in favor of the difference correlation, two in favor of the similarity correlation. The average of coefficients was for likeness .724 and for unlikeness .720, too slight a difference to justify any interpretation.

My study of the figures and my observation of the reactions of the subjects convinced me that the practise effect growing out of familiarity with the material gave such an advantage to whichever grouping was made second as to introduce great uncertainty in the interpretation of results. Only in those cases, it seemed, where the second pair of arrangements gave a lower coefficient of correlation than the first was there evidence of individual variation in the ease with which the categories could be applied. There were only four cases in which the first two arrangements gave a higher correlation than the second two. Msm.'s record shows, apparently, a great preoccupation with similarity; we may conclude that Mfr. and Fmc. are, to a less degree, predisposed to see difference and Lth. to see likeness.

It is, of course, impossible to determine how much influence practise effect may have had upon the figures. In the eight cases (longer series) where the last two arrangements gave a higher correlation than the first two, the increase ranges from .039 to .279. The practise effect for different reagents might well have varied if we may judge at all by the amount of time required for the work. This time in the case of every arrangement was kept by a stop-watch. Meb., who spent most time in making the four arrangements, something over two hours, showed the greatest difference between the two pairs of arrangements in favor of the second, .279. Ssh. spent the next longest time and shows the next highest increase in favor of the second, .248. Jan. and Ado. spent, respectively, only twenty-one and twenty-eight minutes on the whole four arrangements, and gave an increased correlation amounting to only .039 and .051.

A practise effect was apparent not only in a tendency for the third and fourth arrangements to correlate more closely than the first and second, but also in a reduction of the time needed for making the later arrangements. It took Ssh., for instance, thirty minutes to make the first arrangement and thirteen minutes to make the fourth. Except for the very quick reagents (Eda., Ado., Jan.) there is continuous decrease in time for the successive arrangements. General habituation in handling such material is shown, further, by the results of a second test on pairing of hands tried at the close of this experiment on the judgment of similarity and difference; there is great increase in speed and accuracy on the part of certain reagents. The practise effect was particularly evident for Ssh., Gab., and Lth., the first two being particularly painstaking in their arrangements for similarity and difference and showing great increase in the correlation of the third and fourth arrangements.

Let us consider also how far the judgments of similarity and difference seem to represent two distinct mental sets as shown by the correlation between reciprocal arrangements. For one reagent, Awi., the reciprocal correlations are all higher than the direct correlations (long series) and, as his introspections indicate, this subject had very great difficulty in maintaining any distinct set. For other reagents there are cases where the correlation between reciprocal arrangements is higher than that between one or the other of the direct arrangements. There are examples of some very high reciprocal correlations.

The correlation of the reciprocal of the second difference arrangement with the second likeness arrangement is higher than the correlation of the reciprocal of the first difference arrangement with the first likeness arrangement. Hollingworth also found this to be true and accounts for it by the approximation of the two categories "with repetition, adaptation, and familiarity with the material."[8]

Self-consistency certainly increases as the reagent grows more familiar with the material and better adapted to the conditions of the test, but such increasing self-consistency may *raise the second*

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[8] *Loc. cit.*, page 288.

direct correlation as well as the correlation between a direct arrangement and the reciprocal of the inverse arrangement. The effect of practise is not confined to bringing together the opposite categories—an assertion which needs explanation if the opposite categories represent diverse psychological operations,—but is evident also in the ease with which the reagent handles the whole situation. The practise effect must be kept in mind if we would determine the bearing of the results of any such test as the present upon the problems under consideration.

Our general conclusions are as follows: First, the method utilized by Hollingworth requires certain modifications in order to justify the drawing of any conclusions. A long time-interval should intervene between the two arrangements for likeness and the two arrangements for difference in order to minimize the practise effect. Moreover, the object of the test should be carefully explained to each reagent in order to insure his keeping very definitely in mind the mental set required. The introspections of the present subjects indicate considerable difficulty in discriminating between the "least like" and "most unlike." Careful explanation of the purpose of the test would have put them on guard.

Secondly, the outcome of the present test does not indicate that the likeness judgment is given with greater ease than the difference judgment; a greater number of reagents were more self-consistent in giving the latter. The introspective reports assert, also, the relative greater ease of the likeness judgment less frequently than did Hollingworth's subjects. Msm., Tfo., Awi., Ssh., and Jan. report that the similarity arrangement was the easier to make. Lth. and Mfr. found no difference in the ease of the two. Ado. and Meb. asserted that they had more confidence in the difference arrangement, although Meb. adds, "The practise effect of repeated arrangements may have something to do with this feeling." Fmc. found the difference arrangement the easier to give, but was inclined to ascribe this increased ease to practise rather than to purpose or method. So, too, Gab. reported of the difference arrangement, "No easier than the preceding arrangement except so far as familiarity is concerned."

Thirdly, there is some indication of a psychological difference in mental set for logically opposite categories for *certain reagents* and a tendency toward definite preoccupation with likeness or difference. Ado., Jan., and Tfo., the reagents of the most psychological training, speak of distinct sets for the different judgments and were alert to inhibit the wrong one. Ado. and Jan. report sudden peculiar shifts at times from one attitude to another. It required considerable effort of attention to inhibit a shift to the opposite set when ease in manipulation seemed to justify such a shift.

A further bit of evidence as to the difference between a similarity and dissimilarity set occurs in the correlation found between a ranking for self-consistency in giving the likeness judgment and the accuracy with which hands could be paired. The ranking for consistency in giving the likeness judgment is subject to error in that six of the reagents made the two arrangements for likeness before the two for difference, while the six other reagents made the similarity arrangements second. This latter group had the practise advantage. The coefficient of correlation is probably reduced; it amounts to .515 for a first test of pairing handwritings, and .565 for a second test on pairing hands. A ranking for consistency in giving the difference judgment and accuracy in pairing of hands shows no correlation; .02 for the first test in pairing, and —.281 for the second test.

The relation of ease of judgment to material has already been mentioned. To test this specifically the shorter series of samples of writing was used. Two standards were employed, sample 15, a conventional hand, and sample 6, a highly individualized hand. With both standards the average correlation for the difference arrangements is higher than that for the likeness arrangements, but the relative increase in favor of the difference correlation is slightly higher in favor of the individualized writing. On the whole, however, the correlations are much higher for standard 15. Is this due to the choice of the standard or to the chance grouping of subjects? The group arranging the samples with reference to standard 15 had perhaps slightly the advantage with respect to subjects. Mostly, however, the situation seems to be operative in determining the results. The situation also operates, in the case of certain reagents (Ssh., Lth., Mfr.), in causing a shift in the kind of judgment showing the greater consistency. Obviously, the material utilized has so much to do with the outcome that it is desirable to evaluate it in some way.

In any case the problem of the perception of likeness and difference is so important that we should welcome any attempt such as Hollingworth's to break ground.

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REVIEWS AND ABSTRACTS OF LITERATURE

Il Metodo degli Equivalenti. AGOSTINO GEMELLI. Florence: Libreria Editrice Fiorentina. 1914. Pp. 344.

"It is a little surprising that the method of equivalents has not made more impression upon the practise and literature of experimental psychology. . . . The reason for its neglect is, in all probability, the fact that it has no direct bearing upon Weber's Law." This is Titchener's